Metadata Development Guidelines

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Purpose

The following procedures and specifications were developed for the North Coast and Cascades Network (NCCN) of the National Park Service (NPS) Inventory & Monitoring (I&M) Program for the creation of metadata to document I&M-generated data sets. It is recommended that these procedures and specifications also be used for other NCCN data sets that are not necessarily a part of the I&M Program.

These guidelines outline the general approach to generating metadata compliant with the Federal Geographic Data Committee (FGDC) standards, provide links to background information and more detailed guidance documents and Standard Operating Procedures, and describe how to post completed metadata to the NPS NR-GIS Metadata and Data Store. Furthermore, these guidelines will help users comply with the NR-GIS Metadata and Data Store requirement of including the NPS Profile in metadata records and will provide instruction on the creation of the Biological Profile where appropriate.

Scope and Applicability

These guidelines apply to all NCCN staff, contractors and cooperators responsible for generating and submitting metadata to document natural resource data sets. Compliance with these guidelines is required for all I&M project data sets (including geospatial data sets) and for other projects as stipulated by project study plans, cooperative agreements, contracts or research permits. These guidelines should also be used for creating metadata for any data sets that will be uploaded to NPS data repositories such as the NR-GIS Metadata and Data Store and the Biodiversity Data Store.

Definitions and Acronyms

ArcCatalog®	Module in ESRI's ArcGIS® software within which metadata for spatial data sets (coverages, shapefiles) can be created.
Biological Data Profile	Set of definitions for the documentation of biological data through the creation of extended elements to the FGDC Content Standard for Digital Geospatial Metadata (CSDGM).
CSDGM	Content Standard for Digital Geospatial Metadata. The FGDC-promulgated metadata standard established to provide a common set of terminology and definitions for documenting digital geospatial data.
Dataset Catalog	NPS Inventory and Monitoring Program tool for metadata creation, ideal for abbreviated data set documentation but not for fully FGDC-compliant metadata creation.
ESRI®	Environmental Systems Research Institute. A GIS software company.
FGDC	Federal Geographic Data Committee. The interagency committee that promotes the coordinated development, use, sharing, and dissemination of geographic data.
Geospatial One-Stop	Federal government portal that provides public access to geospatial data, metadata, and links to other clearinghouses.

GIS	Geographic Information System. A computer system for capturing, manipulating, analyzing and displaying data related to positions on the Earth's surface.
ISO	International Organization for Standardization. A network of national standards institutes of 150 countries, responsible for the 'ISO 19115' international metadata standard.
Metadata	Data about the content, quality, condition, and other characteristics of a data set, documented in a standardized format.
MP	Metadata Parser. A command-line program developed by the USGS to locate syntax errors in metadata files, verify FGDC-compliance, and convert between file formats.
NBII	National Biological Information Infrastructure. Collaborative program instrumental in developing the Biological Data Profile of the FGDC's CSDGM.
NCCN	North Coast and Cascades Network http://www1.nature.nps.gov/im/units/nccn
NPS	National Park Service.
NPS Profile	The NPS Natural Resource and GIS Metadata Profile extends the FGDC CSDGM to incorporate NPS-specific elements such as park and project details. The NPS Profile includes the Biological Data Profile and the ESRI Profile.
NR-GIS Metadata and Data Store	The NPS Natural Resource, GIS, and I&M Programs' web-based system (incorporating a database, data server, and secure web interface) to integrate data dissemination and metadata maintenance for Natural Resource, GIS, and other program data sets, digital documents, and digital photos.
SOP	Standard Operating Procedure.
SGML	Standard Generalized Markup Language. An ISO standard flexible markup language (predecessor to XML) used in many applications including electronic publishing on the Web.
USGS	United States Geological Survey.
XML	Extensible Markup Language. A simple and flexible text format (a profile, or subset, of SGML) that facilitates large-scale electronic publishing and exchange of data on the Web.

Overview

Data documentation is a critical step toward ensuring that data sets are usable for their intended purposes well into the future. This involves the development of metadata, which is defined as structured information about the content, quality, condition, and other characteristics of a data set. In addition to spatial information, metadata include information about data format, collection and analysis methods, time of collection, originator, access/use constraints, and distribution. Metadata provide the means to catalog data sets, within intranet and internet systems, making their associated data sets available to a broad range of potential users. While most frequently developed for geospatial data, metadata describing non-geospatial data sets are also needed. For example, water samples collected daily for an annual report to summarize water quality should be documented with complete protocols and metadata for the database in which the data are stored.

The general goal of the NPS metadata system is to catalog all data sets and to produce FGDC-compliant metadata for those data sets that require comprehensive documentation. The NPS Natural Resource, GIS

and I&M Programs released the NR-GIS Metadata and Data Store in 2005 as an FGDC-structured database and data server system that provides a secure web interface and tools to import metadata records from desktop metadata authoring programs.

The NPS Integrated Metadata System Plan for spatial and natural resource data sets incorporates the generation of metadata by Network and Park users (through desktop applications), metadata posting to and retrieval from the NR-GIS Metadata and Data Store (through an online, Oracle-based server), and dissemination of non-sensitive records to the public through the Geospatial One-Stop clearinghouse available at: http://gos2.geodata.gov/wps/portal/gos (Figure 1). When completed, the metadata database component of this system will become the master database for NPS spatial and natural resource metadata. For more information, see the NR-GIS Metadata and Data Store website available at: http://science.nature.nps.gov/nrdata/docs/metaplan.cfm.

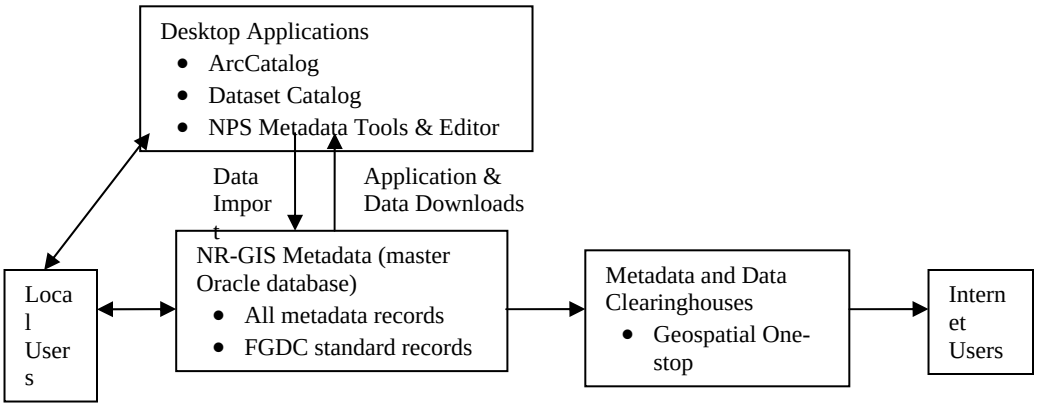

Figure 1. Metadata Workflow Conceptual Diagram, adapted from the NPS Integrated Metadata System Plan.

Metadata creation should begin during the planning phase of a project and can be easily initiated using 'metadata questionnaires,' which should be completed by the Project Lead or Principal Investigator (PI). A formal metadata record will then be created with the assistance of the GIS Specialist or the Data Manager. The metadata record should continue to be updated during the data acquisition and data delivery phases of a project. When the project is complete, the metadata record should be finalized by reviewing for quality, parsing for errors and FGDC- and NPS-compliance, and screening for sensitivity. If appropriate, the resolution of sensitive data may be degraded to allow release to the public and the accompanying metadata revised accordingly. Non-sensitive data will then be uploaded to the NR-GIS Metadata and Data Store by the Data Manager or GIS Specialist.

Currently, the NCCN uses ArcCatalog and Dataset Catalog for metadata authoring. However, with the recent release of the NPS Metadata Tools and Editor (which functions both as a stand-alone program and as an extension to ArcCatalog), it is recommended that network users begin using this program in conjunction with ArcCatalog as the preferred system for metadata creation. The NPS Metadata Tools and Editor provides for population of the NPS Profile (NPS-specific metadata elements, some of which are required for data and metadata upload to the NR-GIS Metadata and Data Store) as well as the Biological Profile of the FGDC Content Standard for Digital Geospatial Metadata (CSDGM) for data sets containing biological information. The NPS Metadata Tools and Editor can be used to create metadata for spatial and non-spatial data sets.

Procedures and General Requirements

General metadata creation will follow the steps diagramed in Figure 2. For detailed, step-by-step instructions on creating a metadata record, see Metadata Procedures SOP (NCCN 2006a).

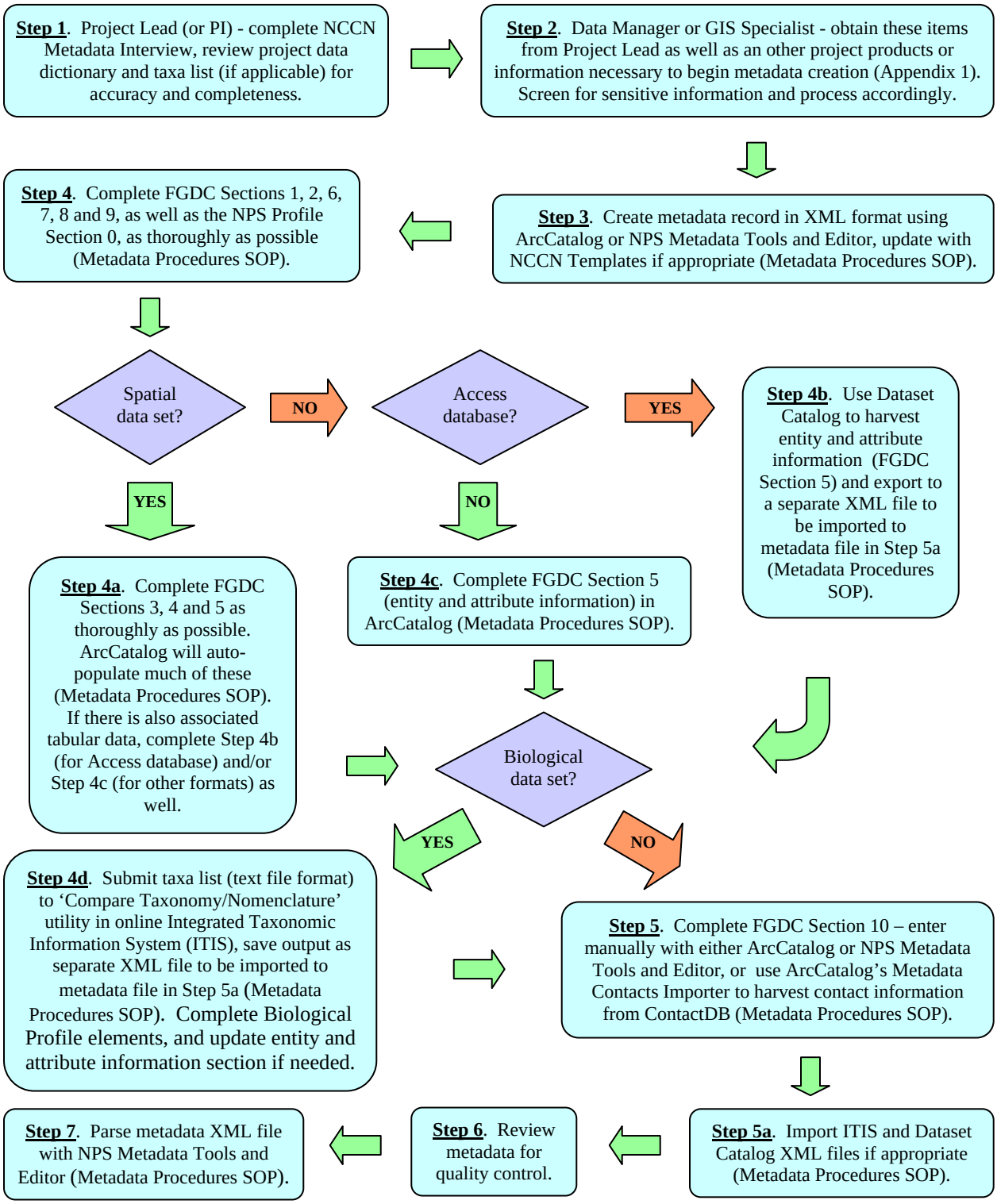

Figure 2. Metadata creation workflow.

1. Metadata Questionnaires and Information Gathering.
    A. The Project Lead (or PI) should obtain and complete the NCCN Metadata Interview (NCCN 2006b)at project onset to facilitate compiling the information required to create FGDC- and NPS-compliant metadata.
        i. The Data Manager or GIS Specialist can provide assistance in obtaining the NCCN Metadata Interview, and if needed.
        ii. The NCCN Metadata Interview may continue to be edited during data acquisition; the Project Lead or Principal Investigator should coordinate with the Data Manager or GIS Specialist as changes are made to the metadata record.
    B. If a data dictionary has been created for the project, this will provide much of the information needed to complete the Entity and Attribute Information (FGDC Section 5) of the metadata record.
    C. For data sets containing biological data, the taxa list should be reviewed by the Project Lead (or PI) for completeness and taxonomic accuracy.
    D. For a complete list of information that should be compiled to assist in metadata creation, see 'Products and Information Necessary for Metadata Creation' (Appendix 1).
2. Data Sensitivity Review. If the data includes any information about protected, threatened or endangered species, it may not be releasable to the public.
    A. For more information on screening data for sensitivity, refer to Sensitive Information Guidelines (NCCN 2006c, in development).
    B. Sensitive data and metadata should not be posted to the NR-GIS Metadata and Data Store at this time. Future releases (likely Version 2) of the NR-GIS Metadata and Data Store will include support for managing sensitive data and metadata.
3. Metadata Software Selection. Use the information in the completed NCCN Metadata Interview to create a metadata record for each data set using the following desktop applications.
    A. The NPS Metadata Tools and Editor, ArcCatalog. For those data sets identified as requiring FGDC-compliant metadata (*all* spatial data sets), formal documentation can be generated with these two programs.
        i. ArcCatalog automatically harvests spatial organization and reference information as well as entity and attribute information for GIS data sets. Refer to ESRI help documentation within the software for details on metadata creation.
        ii. The NPS Metadata Tools and Editor v1.1 (originally created as an extension for ArcCatalog by the NPS Midwest Region) is provided as a stand-alone program or as an extension for ArcCatalog and is available at: http://science.nature.nps.gov/nrgis/tools/editor.cfm
            a. It can be used for metadata creation and editing, import, export and parsing (MP is built in).
            b. The stand-alone version is preferred for documenting non-spatial data sets.
            c. The extension version enhances ArcCatalog to handle the NPS and Biological Data profiles and is useful for spatial data sets.
            d. The next release (summer 2006) is anticipated to have entity and attribute harvesting capabilities.
            e. Help documentation on the use of the NPS Metadata Tools and Editor for creating and posting metadata is available on the NR-GIS Metadata and Data Store website at: http://science.nature.nps.gov/nrdata/docs/metahelp/metahelp.cfm
    B. Dataset Catalog (v.3). With the release of the NPS Metadata Tools and Editor, the Dataset Catalog is of limited usefulness. However, it is currently the best tool for harvesting entity and attribute information from Microsoft® Access databases, and until the next release of the NPS Metadata Tools and Editor, is recommended for this capability.

i. Metadata records can now be exported to Extensible Markup Language (XML) format as required by the NR-GIS Metadata and Data Store. Thus entity and attribute information harvested from an Access database can be imported directly to an existing metadata record in the NPS Metadata Tools and Editor.
ii. For reports, data tables, and other non-spatial data sets, Dataset Catalog can be used for preliminary (but not fully FGDC-compliant) documentation.
    a. While metadata elements in the Dataset Catalog may be mapped directly to the FGDC structure, the NPS Metadata Tools and Editor or ArcCatalog will still be needed to complete formal metadata.
    b. Dataset Catalog is FGDC-compliant only for Identification Information and Metadata Reference Information (FGDC Sections 1 and 7, respectively).
iii. For more information on Dataset Catalog procedures, refer to 'NCPN User Guidelines for Dataset Catalog,' Appendix C of the Northern Colorado Plateau Network, Data Management Plan (Beer et al 2005).

4. NPS and NCCN Requirements.
   A. All GIS data sets to be posted to NR-GIS Metadata and Data Store must conform to the NPS Metadata Profile (http://science.nature.nps.gov/nrdata/docs/npsprofile.cfm) in addition to the FDGC CSDGM.
      i. Some NPS Profile elements (NPS Unit Name, NPS Unit Code, and NPS Theme Category) can be populated from the NPS Metadata Thesauri, available as a downloadable Excel file at: http://science.nature.nps.gov/nrdata/docs/metastds.cfm.
         a. The NPS Metadata Tools and Editor includes 'stylesheets' (editing views) which have picklists for populating the NPS Profile and Biological Data Profile elements.
         b. If the NPS Profile metadata elements have not been populated, the NR-GIS Metadata and Data Store will prompt for them during upload.
      ii. NR-GIS Metadata and Data Store also requires an ISO Topic Category for each metadata record
         a. This element can be populated prior to upload using the NPS Metadata Tools and Editor picklists or manually entered (refer to the NPS Metadata Thesauri).
         b. The NR-GIS Metadata and Data Store will prompt for this during upload if not already populated.
      iii. Refer to any of the following NR-GIS Metadata help documents, Creating Metadata, Creating Simple Geospatial Metadata, Creating Non-Geospatial Metadata, and Metadata Authoring Guidance, (NR-GIS Data Store 2005b, c, d, g) for specifics on NPS and NR-GIS Metadata and Data Store requirements.
      iv. Templates can be used to add NPS Profile elements to existing metadata files or to create new metadata files. Default NPS Profile templates are available at: http://science.nature.nps.gov/nrdata/docs/metahelp/metahelp.cfm.
   B. NCCN requires the following references in all metadata records associated with I&M projects.
      i. Metadata records should reference the NCCN project name and code as maintained in the NCCN Project Tracking Database.
         a. The preferred location for this information is in the Related Key element (<RelKeyV></RelKeyV>) in the Program Information section (NPS Section 0) of the NPS Profile.
         b. Alternatively, this could be entered in the Larger Work Citation element (<lworkcit></lworkcit >) of the Citation Information (FGDC Section 8).
      ii. Metadata records should contain references to all products generated by a project (e.g. GIS layers, relational databases, and reports). These references can be entered

in the repeatable Cross Reference element (<crossref></crossref>) of the Identification Information section.

C. An ESRI sample script is available to be used in ArcCatalog for more automated population of the Contact Information (FGDC Section 10, which is a repeating section throughout a metadata record). The sample provides an Access database (ContactDB) for storing contact information and a metadata importer to add that contact information from that database to an existing metadata record.
   i. The ContactDB can be populated and periodically updated from the Contacts, Addresses, and Contacts_Addresses tables in the NCCN Project Tracking Database.
   ii. See Appendix 4 for specifics on configuring ArcCatalog to use the ContactDB and for populating and updating it from the NCCN Project Tracking Database.

D. Standard language for NPS liability should be inserted into the Distribution Liability metadata element (<distliab></distliab>) of the Distribution Information (FGDC Section 6).
   i. This can be found at: http://www.nps.gov/gis/liability.htm as well as in the NR-GIS Metadata and Data Store help documentation, available at: http://science.nature.nps.gov/nrdata/docs/metahelp/metahelp.cfm.
   ii. If it is not already entered, NPS Metadata Tools and Editor and the Dataset Catalog will populate this field automatically.

5. Biological Data Profile. If a data set includes biological information, the Biological Data Profile provides a set of extended metadata elements to document the species observed, taxonomic information, methods, and analytical tools.
   A. The most direct, and NCCN preferred, means to populating the Biological Data Profile metadata elements are outlined in Biological Profile (National Biological Information Infrastructure - NBII) Metadata Guide (NR-GIS Data Store 2005a).
      i. This approach primarily utilizes the NPS Metadata Tools and Editor and may also require the entity and attribute harvesting capability of Dataset Catalog for Access data sets.
   B. The following two guidance documents describe alternative approaches to completing the Biological Data profile for a metadata record. Note that the first requires the use of additional metadata creation software (Spatial Metadata Management System, or SMMS):
      i. Metadata Tools Used in the Creation of the FGDC Biological Data Profile (Callahan and Devine, 2004).
      ii. National Biological Information Infrastructure (NBII) Metadata Steps (McGuire 2004).
6. Metadata Review. Review metadata for quality control (QC) prior to posting to NR-GIS Metadata and Data Store. A useful QC Checklist is available for download on the NPS Intermountain Region GIS website at: http://imgis.nps.gov/tips_templates.html.
7. Metadata Parsing and Exporting to XML format. The NR-GIS Metadata and Data Store requires that metadata records be parsed the FGDC-structured metadata and then exported to XML format.
   A. If using ArcCatalog, these steps can both be done directly with the NPS Metadata Tools and Editor. See Parsing Metadata with the NPS Metadata Tools and Editor (NR-GIS Data Store 2005i) for more information.
   B. If using other applications, export the metadata first to ASCII text format and then parse with Metadata Parser (MP). MP can simultaneously output an XML format metadata file as well.
      i. MP must be customized to handle NPS, Biological Data or ESRI Profile metadata elements. For specifics, refer to:
         a. The README.txt file included in the zipped NPS Metadata Profile configuration files available from the NR-GIS Metadata and Data Store website at: http://science.nature.nps.gov/nrdata/docs/metahelp/metahelp.cfm
         b. Parsing Metadata with the NPS Metadata Tools and Editor (NR-GIS Data Store 2005i)

8. Metadata Posting. Post the metadata to the NR-GIS Metadata and Data Store.
    A. Authorized NPS staff may request upload and edit access to the NR-GIS Metadata and Data Store through the NPS Natural Resource Universal Web Login (UWL) available at: https://science1.nature.nps.gov/nrdata/. This is also the portal for uploading data.
    B. Metadata about non-sensitive data will automatically be made available to the public via the Geospatial One-Stop metadata clearinghouse (Figure 1).
    C. More information about metadata upload format requirements is available at: http://science.nature.nps.gov/nrdata/docs/metahelp/metainfo.cfm and in Metadata and Data Uploading Guidance (NR-GIS Data Store 2005g).
9. Editing/Updating Metadata Already Posted to NR-GIS Metadata and Data Store. As of Version 1, the NR-GIS Data Store application allows online editing of NPS Theme Category and ISO Theme Keyword information and the deletion of single metadata records and/or data sets only (see help documentation at: http://science.nature.nps.gov/nrdata/docs/metahelp/edithelp.cfm).
    A. For metadata records simply needing edits to NPS Theme Category or ISO Theme Keyword elements, refer to Editing Category Information (NR-GIS Data Store 2005f).
    B. If a metadata record posted to the NR-GIS Metadata and Data Store contains errors or requires edits to other elements, it will need to be deleted from the NR-GIS Metadata and Data Store, edited, and then reposted. Refer to Deleting Single Records (NR-GIS Data Store 2005e).
        i. The user should first download the metadata record (save in XML format) to the local system, then edit as needed in a text editor or metadata software program.
        ii. The edited metadata record can then be resubmitted to the NR-GIS Metadata and Data Store.
        iii. If the data set documented by the metadata record requires no edits, it will not need to be reposted. Simply ascertain that the metadata file still specifies the correct pathway to the data set on the NR-GIS Data Server before resubmitting the metadata file.

Responsibilities

Project Lead (NPS)

The person creating or modifying data as part of any NPS I&M project is also responsible for initiating metadata development. NPS-compliant metadata must accompany all data sets (metadata for geospatial data sets must in addition be FGDC-compliant) and are due when the final report and deliverables are submitted to the NCCN and/or to the parks included in the study. The Project Lead may choose to delegate this responsibility depending upon who is assigned the role of data set developer/administrator. Individuals unfamiliar with metadata generation should use the guidance provided in this document and reference materials. For additional assistance the Data Manager or GIS Specialist may be contacted.

Principal Investigator (cooperator or contractor)

If data originate outside the NPS, the Principal Investigator will have primary responsibility for compliance with the metadata standards as set forth in this document and providing documentation of the data set in the form of a metadata XML file as stipulated by written agreements with NCCN parks (contracts, cooperative agreements, study plans, research permits). NPS-compliant metadata must accompany all data sets (metadata for geospatial data sets must in addition be FGDC-compliant) and are due when the final report and deliverables are submitted to the NCCN and/or to the parks included in the study

Data Manager and/or GIS Specialist (NPS)

The Data Manager must ensure that NPS-compliant metadata are generated for all non-spatial I&M data received from the Project Lead (or Principal Investigator). The Data Manager or the GIS Specialist must ensure that all geospatial data resulting from an I&M project are FGDC- and NPS-compliant. The Data Manager or the GIS Specialist can provide assistance in metadata creation.

Recommended Citation

North Coast and Cascades Network – National Park Service. 2006. Metadata Development Guidelines. USDI National Park Service. Available at: http://www1.nature.nps.gov/im/units/nccn/dm_docs.htm

Contact Information

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Ebey's Landing National Historical Reserve	Please refer to contacts for North Cascades NP
Fort Vancouver National Historic Site	Please refer to contacts for Mount Rainier NP
Lewis and Clark National Historical Park	Please refer to contacts for Mount Rainier NP
San Juan Island National Historical Park	Please refer to contacts for North Cascades NP

Reference Documents

Related Guidance

- Boetsch, J.R., B. Christoe, and R.E. Holmes. 2005. Data management plan for the North Coast and Cascades Network Inventory and Monitoring Program. USDI National Park Service. Port Angeles, WA. 88 pp. Available at: http://www1.nature.nps.gov/im/units/nccn/monitoringreports.htm

- North Coast and Cascades Network – National Park Service. 2006a. Metadata Procedures SOP. USDI National Park Service. Available at: http://www1.nature.nps.gov/im/units/nccn/dm_docs.htm.
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- NR-GIS Data Store. 2005f. Editing Category Information. Natural Resource and GIS Programs of the National Park Service. Available at: http://science.nature.nps.gov/nrdata/docs/metahelp/NR-GISDataStoreEditCategory.pdf
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- NR-GIS Data Store. 2005i. Parsing Metadata with the NPS Metadata Tools and Editor. Natural Resource and GIS Programs of the National Park Service. Available at: http://science.nature.nps.gov/nrdata/docs/metahelp/NR-GISMetadataParsingGuidance.pdf

Other Citations and References

- Beer, M., E. Nance, A. Wight, M. Powell, and R. DenBleyker. 2005. NCPN User Guidelines for Dataset Catalog (Appendix C). *In*: Northern Colorado Plateau Network, Data Management Plan. National Park Service, Inventory and Monitoring Program, Northern Colorado Plateau Network, Moab, UT. 86 pp. Available at: http://www.nature.nps.gov/im/units/ncpn/InfoManagement.cfm
- Callahan, K and H. Devine. 2004 (draft). Metadata Tools Used in the Creation of the FGDC Biological Data Profile. Northeast Region of the National Park Service. Available at: http://science.nature.nps.gov/im/datamgmt/docs/SOP_BioDataProfileTools_v1.doc
- Federal Geographic Data Committee. FGDC-STD-001-1998. Content Standard for Digital Geospatial Metadata (revised June 1998). Federal Geographic Data Committee. Washington, D.C. Available at: http://www.fgdc.gov/standards/projects/FGDC-standards-projects/metadata/base-metadata/v2_0698.pdf

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- Natural Resource and GIS (NR-GIS) Metadata and Data Store Project Update: December 22, 2004. USDI National Park Service. Available at: http://science.nature.nps.gov/nrdata/docs/dsnews.cfm
- NPS Integrated Metadata System Plan for Spatial and Natural Resource Data Sets - FY2004. Available on the NR-GIS Metadata and Data Store website: http://science.nature.nps.gov/nrdata/docs/metaplan.cfm
- NR-GIS Metadata and Data Store Help Documentation. 2005. Natural Resource and GIS Programs of the National Park Service. Available at: http://science.nature.nps.gov/nrdata/docs/metahelp/metahelp.cfm

Tutorials

- FGDC Online Geospatial Metadata Resources. Available at: http://fgdc.gov/metadata/online-metadata-resources
- NBII metadata training materials. Available at: http://www.nbii.gov/datainfo/metadata/training/ttt/index.html

List of available tools

- Dataset Catalog – a desktop program to create minimally FGDC compliant metadata and that can harvest Microsoft Access database entity and attribute information as well as export to XML. Available at: http://science.nature.nps.gov/im/apps/datacat/index.htm
- Metadata Parser (MP) – a USGS developed command-line program to locate syntax errors, verify FGDC compliance, and convert between file formats. Available at: http://geology.usgs.gov/tools/metadata/
- NPS Metadata Profile Configuration File for Metadata Parser – a zip file containing the necessary NPS Profile configuration file and NPS and ESRI Profile extension files for parsing NPS XMLs with the standalone MP, two sample MP executable files, and a README file. Available at: http://science.nature.nps.gov/nrdata/docs/metahelp/metahelp.cfm
- NPS Metadata Tools and Editor (with MP built in) – a desktop utility that functions as a stand-alone or as an extension to ArcCatalog. It can be used to create and edit metadata in the NPS Profile (which is FGDC compliant and includes the Biological and ESRI Profiles). It also parses (MP is built in) and exports files in XML format for upload to the NR-GIS Metadata and Data Store. Available at: http://science.nature.nps.gov/nrgis/tools/editor.cfm
- Tk Metadata Editor (TKME) – a simple editor for creating and editing formal, FGDC-compliant metadata. Available at: http://geology.usgs.gov/tools/metadata/tools/doc/tkme.html

Revision History

Revision Date	Description of Change	Author	Effective Date
Mmm dd, yyyy		Full name	Mmm dd, yyyy

Appendix 1. Products and Information Necessary for Metadata Creation

1. Products:
    - Study Plan
    - Complete methods documentation, including field data collection, analysis, and GIS data layer processing steps
    - Data dictionary, if available
    - Grant proposals, contracts, agreements, permits
    - Data collection forms
    - Publications
    - All reports, including annual, progress and final reports
    - Databases
    - Tabular data (Microsoft Excel spreadsheets, Microsoft Access databases, text files, etc)
    - Catalog of vouchers (photographs/specimens)
    - GIS data layers (ArcView shapefiles or ArcInfo e00 files)

2. Information:
    - Is the data sensitive; are rare, threatened or endangered species reported?
        - If yes, what are the access constraints?: Public, NPS Only, NCCN Only, Park Only
    - Funding sources
    - Additional contact persons and their contact information
    - List of others who deserve credit for the project
    - Verify the data accuracy and completeness:
        - Have all data been entered?
        - Have all data been verified for accuracy?
        - Have all data been validated for logical errors?
    - Reference for any codesets or controlled vocabulary used in the project (for example, Henderson's plant associations, American Ornithological Union species codes, and Integrated Taxonomic Information System TSNs)
    - Keywords for searching on data set
    - Related data sets for cross referencing
    - References for any models, analytical tools or statistical procedures used to develop the data set